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AFTER A

By Dr. Edwin E. Slosson.

For more than dozen years chemists have been hunting for something that nobody has ever seen and yet everybody has to have. It is in our food; must be or else we starve with our stomach full. In lack of it, the white rat babies of the laboratory - and, what's worse, white human babies by the thousand - may die an early death or be stunted for life. Our sense of taste which is generally a safe guide to nutritive values, fails us in the case of the vitamins, for we cannot tell by the savor which foods contain these essentialingredients , yet if we fail to include such foods in our daily dietary we soon suffer for it in health and vigor.

At the head of the list of vitamins is that known provisionally as "A". Chemists could not give it its proper name because they did not know what family of compounds it belonged to. They only knew that certain foods were short of something essential for growth and health.

Their problem was like the riddles that used to be popular with puzzlers. For instance:

"My first is in butter, but not in lard".

It is in sweet potatoes but not in Irish, It is in yellow corn, but not in white. It is in codliver oil, but not in olive oil. What is it?

McCullom of Madison, who found out these facts about 1912, called the evasive vitamin "unidentified dietary factor fat-soluble "A", which expressed what was known at that time, but obviously was not the sort of snappy slogan that the advertiser of a breakfast food desires. Chemists all over the world have been trying ever since to isolate and purify Vitamin A, but unsuccessfully.

At last, however, the problem appears to have been solved and Japan may get the honor of isolating A. Katsumi Takahashi and other investigators, working in the laboratory of Professor U. Suzuki in the Insitute of Physical and Chemical Research at Tokyo, report having extracted and analyzed Vitamin A from coldliver oil, spinach, and green laver, a seaweed. It comes out finally as a yellowish red oil, transparent and viscous, with a characteristic but not disagreeable odor and a slightly bitter taste, resembling somewhat the yellow matter of carrots and green leaves. It is not so unstable as had been supposed for it can be distilled in a vacuum without decomposition.

The courtesy of chemistry gives to the discoverer of a compound, like the father of a child, the right to christen it, and fortunately for the rest of the world, the Japanese chemists have not insisted upon giving their find a Japanese name. They have instead called it "biosterin" because it resembles in composition and behavior the already known "cholesterin", which occurs commonly in plant and animal cells, although its function is still a mystery.

One of the interesting peculiarities of biosterin is that it will print its image on a photographic plate in the dark. That is, it acts like radium in giving off some sort of active rays or emanation capable of producing an impression on the sensitive plate as light does. Various oils and terpenes will act like this but none of them are so active.

The effect of a minute amount of biosterin on the vital processes is most amazing. A daily dose of no more than a millionth of a gram was sufficient to keep up the growth of young rats that were fed on a diet so deficient in this vitamin that they would otherwise stop growing and die. But, on the other hand, rats that took a drop too much died of it, like those who had none. The fatal dose is about ten thousand times the normal ration, so there is ample margin and no one is endangered by getting an overdose of biosterin in his food.

If this turns out to be really the long sought vitamin, it will mark the beginning of a new era in food science for chemists. When the chemist gets hold of a definite compound, he may make it in quantity, or others similar to it, which may have different effects. To be able to alter the nutritive value and influence of a diet by adding a drop or two of something, puts into the hands of the chemist a new power of controlling the processes of life that may lead to strange results.

DENUDED SOUTHERN HILLSIDES TO BE MADE INTO TERRACED FARMS

By Prof. Walter B. Pitkin,
Columbia University

American mechanical genius is beginning to revolutionize mountain agriculture. In the last twenty years the art of rice growing has been taken out of the hands of the Asiatics and adapted to machine methods so successfully that our high-priced workers now produce the crop as cheaply as the eight-cent-a-day Chinese coolie. But this is as nothing compared with the changes being wrought in the handling of hillsides down South.

For years the Appalachian slopes have been washing away, with terrific losses to the farmer, because men of western European stock applied the tricks of flat-land farming to the steeps. They had never heard of the terraces and water holes which the Corsican mountaineer, the Javan farmer, and the persistent Japanese make to hold the rains and the rich earth on slopes as sharp as a house roof. When news of these methods first came to the American, he was unwilling to use them because of the vast amount of heavy labor required to build such dirt architecture. But, after a while, he began wondering whether machines couldn't turn the trick. And, surely enough, machines would.

A retired engineer, Lawrence Lee, of Leesburg, Virginia, seems to have been the first to hit on a way of using tractors and a specially designed scraper for such work. Even in the heaviest thunderstorms of summer, hardly a drop of water

runs off the sixty acres which Mr. Lee now has terraced and planted as orchard. Some parts of this tract have a pitch of about forty degrees - which is quite as great as most of the remarkable mountainside terraces in the Philippines and Java, where for centurtes the banking of soil and care of crops have all been done by the most laboricus of handwork.

In the last few years progressive farmers in North and South Carolina have adopted this new technique. Especially in the badly eroded stretches along the Catawba River, thousands of acres have been delivered from the ravages of the rains. Applied to the millions of acres in Appalachia which are being washed away, this method will conserve many hundred million dollars' worth of topsoil; and it will convert what is now an unprofitable wilderness into a rich empire. Land worth nothing today can, in a few seasons, be transformed into forage crop acreage worth at least thirty dollars per acre; and, after ten or fifteen years of tree planting along the terrace ridges, this same land, as had already been demonstrated in Virginia, yields a return that makes it worth from seventy-five to two hundred dollars per acre.

Prof. J. Russell Smith, the econimic geographer at Columbia University, has made a special study of the Old World terrace methods and of these new American ways. He has found rough mountainsides in Corsica yielding nut crops as heavily as Illinois bottom lands yield corn. He states that a new dividend-paying country about the size of France will be added to the United States as soon as the Appalachian region adopts generally the tractor-built terrace of the Lee type and develops fast growing hardwood trees to plant on the land.

That oaks, walnuts, and hickories can grow much faster than the common run of them now do is quite as certain as the improvements which have been wrought in corn, wheat, apples, and many other crops. Were it possible to increase, by selective breeding, the rate of wood growth by only twenty or twenty-five per cent., this would eventually add many millions of dollars to our national wealth.

NEW SWEDISH RAIL CAR CARRIES OWN WATER POWER

Carrying its own private waterfall to run itself by a water turbine, a railway car utilizing a new type of power transmission is attracting the attention of Swedish transportation engineers. The prime motive power consists of an internal combustion motor of the usual type, but instead of using gears or electric transmission, the motor operates a centrefugal pump, which supplies water under pressure to a turbine directly geared to the driving axle. The speed of the car is governed by the height of the artificial "head" of water created by the pump. With a motor of 180 horse power the car has attained a speed of 50 miles per hour. An especial advantage claimed for the new transmission method is freedom from jerks in starting and stopping.

Swedish railroads have already ordered the manufacture of four motor railroad cars and one Diesel locomotive equipped with the new hydraulic drive.

There are species of wild apples in China that are no larger than good sized peas.

SURFACE OF MARS LIKE DESERT MOUNTAIN TOPS

(By James Stokley, Science Service Staff Writer)

If Mars has any inhabitants, they must be able to get along on about one-twentieth of the water one finds on the tops of the semi-desert mountains in southern California. Dr. Charles E. St. John, astronomer at the Mt. Wilson observatory told the astronomers at the annual meeting of the American Astronomical Society how he learned of the Martian drought by means of the spectroscope mounted on the great hundred-inch telescope, the largest instrument of its kind in the world.

When light passes through a substance ,certain colors are absorbed, and what these colors are can be learned by means of the spectroscope. Specifically, light passing through water vapor of a certain density will always be absorbed in the same way. By catching the light from the planet with the great reflector and analyzing it with the spectroscope, Dr. St. John was able to determine the amount of moisture in the Martian atmosphere.

There was a possible source of error in the absorbing effect of water vapor in the earth's own atmosphere. This was corrected by taking spectrographic pictures of the sky. When the absorbing effect shown in these was subtracted from the total in the plates from the planet, the remainder represented the absorption in the atmosphere on Mars. This proved to be only five per cent. as great as the absorption of the very dry atmosphere above the summit of Mt. Wilson, indicating that the surface of Mars must be highly arid.

Measured by the same method, the amount of oxygen on the neighboring planet also is relatively very low; according to Dr. St. John , it is only 60 per cent. as great as the oxygen supply on Mt. Everest, where exploring expeditions have had to resort to the use of oxygen tanks in order to keep alive.

Though deficient in water and oxygen, there is no doubt that Mars still possesses an atmosphere. E. C. Slipher, of the Lowell Observatory at Flagstaff, Arizona, showed that photographs made with red-light filters made the planet appear larger and shoed greater detail than those made with blue-light filters. Red light is known to have greater powers of penetration through the atmosphere than blue; so that the photographs would tend to indicate the presence of an atmosphere on Mars.

Mars is more thrifty than the earth of the radiation it receives from the sun. Dr. C. O. Lampland, using the Coblentz radiometer, found that though Mars receives less energy from the sun it absorbs all but 15 per cent. of what it receives,whereas the earth reflects nearly half of the light and heat falling on it. The temperature of Mars, Dr. Lampland concludes, may not be greatly different from that of the earth. Dr. Lampland has also studied the planet Mercury with the radiometer, but finds Venus unapproachable because of its dense envelope of presumably cloudy atmosphere.

One stocking for every person in the United States is manufactured in one month; 56,636,052 pairs were manufactured in June, 1925, of which 15,959,448 were silk and 24,354,768 cotton.

BIRDS CAN'T APPRECIATE THEIR OWN PLUMAGE

The gorgeous, shimmering, blue-green tail of the male peacock bird and the proud feathers of the barnyard rooster may mean nothing at all to the modest pea hen and the little red pullet, for birds do not look at things the way people do. That, at any rate, is the conclusion drawn by Dr. H. Erhard of this city, who has experienced with the eyesight of birds at the university eye-clinic in Munich.

Dr. Erhard found that both male and female birds that fly by day see everything in a bright red-orange light, for they are but slightly sensitive to the short waves of light that make blue and violet visible. Night birds on the other hand never see red, for they are more or less insensitive to the colors at that end of the spectrum. These facts may give a clew to bird behavior and shake the Darwinian theory that the beautiful plumage of birds is due to selection by their mates. It is a curious point that blue and violet colors are as often found in the feathers of day birds as other colors.

The difference in vision between the day and the night birds is due to tiny globules of oil in the retinas of the eyes, according to Dr. Erhard. The globules in the day birds range in color from neutral to red, orange and yellow while in the night birds they are blue-green. These act as color screens and determine the birds' color sense.

INSULIN SAID TO BE A SULPHUR COMPOUND

Insulin, the well known remedy for diabetes, may be a compound of sulphur. This conclusion is indicated by research work done by Dr. John J. Abel and B.M.K. Geiling at the California Institute of Technology, to be reported in the forthcoming issue of the Journal of Pharmacology and Experimental Therapeutics. Although a preparation of insulin from the pancreas gland of cattle has been in common use for three years, no chemist has yet succeeded in purifying and analyzing this unstable substance.

In investigating chemical and other properties of insulin, the authors were able to purify the commercial product until its potency was increased from three to five times. When this purified and concentrated insulin was treated with sodium carbonate, sulphur separated from the extract and the insulin lost its potency. This indicates that insulin is dependent upon the presence of sulphur in its make-up for its power to remedy the effects of diabetes.

As a result of this discovery the question arises whether or not the pancreas, which produces insulin, may be dependent upon a sufficient supply of sulphur in food for its ability to produce this hormone.

Automatic telephones have become popular in China in the last five years and there are now a number of public exchanges and many private ones.

FINDS CAUSE OF ECLIPSE BANDS

The shadow bands, rippling alternations of light and shade that chase over the landscape just before and after total solar eclipses, are due to disturbances in the atmosphere, according to Dr. Charles Clayton Wylie of the State University of Iowa, speaking before the American Astronomical Society at Northfield, Minn.

These phenomena, which have long been a puzzle to astronomers, were especially pronounced during the most recent of total eclipses, which darkened the populous northeastern part of the United States last January. Dr. Wylie states that this fits in well with his theory, inasmuch as the atmosphere above cities is much disturbed, especially in winter, by rising currents of warm air.

Dr, Wylie has tested his theory on a small scale, with the image of a bright star in a darkened room. "If the light from a star such as Sirius is allowed to fall on a white surface in a room otherwise dark," he said, " a person of keen eyesight may see a pattern of light and dark mottlings, because the source of light is a point. Ordinarily in sunlight these mottlings are not seen, because the patterns overlap, but at the time of an eclipse, just before and just after the moon covers the sun, a narrow sliver of light remains, which is practically a line, and so the overlapping is in one direction only, and the effect may resemble the stripes in a flag."

The American Astronomical Society elected as its officers for the ensuing year: Prof. George G. Comstock of Beloit, Wis. , president; Prof. S. A. Mitchell of the Leander McCormick Observatory of the University of Virginia, vice-president Prof. Joel Stebbins of the University of Wisconsin, secretary, and Prof. Benjamin Boss of the Dudley Observatory at Albany, N.Y., treasurer. Prof. H. C. Wilson of Carleton College and Dr. W. H. Wright of the Lick Observatory were elected to the council of the society.

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300 POUNDS PRESSURE IN 5 MINUTES CLAIMED FOR NEW GERMAN BOILER

A steam boiler of revolutionary design has been produced by a German engineer-inventor, Bernhard Becker, of Nohra, near Weimar. When stripped of its insulation, it is a cubical box only about eighteen inches on a side; but according to its inventor's claims it can produce over 600 pounds of steam per hour, and can get up a pressure of 300 pounds per square inch in five minutes.

Its action depends on the introduction of water not as a liquid, but as a spray of almost mist-like fineness. This is injected into an intensely heated coil of jointless tubing, where it is almost instantly converted into high-pressure steam. There is a small steam chamber, but no water reservoir. The new quick steaming boiler is thought likely to be useful in automobiles and farm motors.

The United States is the most important copper producing country in the world and now accounts for nearly two thirds of the yearly supply.

A research institution for the improvement of cotton was recently opened at Indore, Central India.

SCIENTISTS MAP DEEP-SEA CURRENTS

Great submarines currents continuing for thousands of miles under the sea and finally emerging into the sunlight on another part of the earths surface have been discovered by German explorers on board the ship "Meteor", which left Wilhelmshafen on April 6 for a two years' deep-sea expedition. It has been definitely determined that a vast stream of water starts in the northern Atlantic far below the surface and continues its course until it reaches a point about 2000 miles south of the equator where it slides to the surface. From the southern Polar regions a similar current goes northward. Whales and many other kinds of fish follow these currents because they find their food in them. After the "Meteor" has completed her fourteen scheduled trips across the Atlantic between America and Africa she will steam on to Bouvet Island in the southern Polar regions and from there eastward.

OIL CAUSES WATER TO KILL SKEETERS

Mosquito "wigglers", or larvae, are not smothered by the oil sprayed on their pools; they simply drown. The researches of Dr. David Keilin, working at the Molteno Institute in South Africa, run counter to the older and commonly accepted notion.

Mosquitoes and their larvae, like all insects, have no lungs or gills to breath with, such as higher animals have. They get the oxygen they require through systems of tubes opening directly to the outside air and branching inward to all parts of their bodies. Dr. Keilin discovered that mosquito larvae had certain cells in these tubes that secreted a fatty substance, which served to keep the water out. But upon experimenting with them, using oil, chloroform, strong alcohol and other liquids that dissolve fats, he found that if these protective secretions were thus dissolved, the breathing tubes of the larvae filled up with water, and the hapless "wigglers" drowned.

SCIENTISTS LEARN WHY EGGS HAVE SHELLS

The limy shells of eggs are there not only to protect the inside against breakage and to prevent its drying up but also as a source of calcium for the development of the embryo chick, according to the findings of a group of German scientists, Drs. Plimmer, Aders, and Lowndes, who analyzed hatched, half hatched, and unhatched eggs. An unhatched hen's egg contains about .04 grams of calcium and a freshly hatched chick about five or six times as much. The tough "skin" that encloses the yolk and white absorbs more and morecalcium as hatching proceeds and becomes quite opaque by the time the chick is ready to come out. The experimenters claim that the carbonic acid and water given off during incubation dissolves the calcium of the eggshell and makes it available for use by the embryo.

The number of passengers carried in 1924 by French airplanes was over 16,000, and the quantity of merchandise carried in the same year was about 2½ million pounds

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BELIEVES TOBACCO CAUSES STOMACH ILLS

Tobacco may cause nervous disturbances in the stomach and even play a part in the formation of ulcers and cancers, in the opinion of Dr. Lickint who has done extensive research on the effect of tobacco on the various digestive processes. He has definitely shown that nicotine shows up the digestive action of pepsin and rennet, stomach secretions. Potassium sulphocyanate. a substance that hinders the digestion of proteins, wasfound by him in the saliva of smokers.

PSYCHO-ANALYSIS BY FILM IS LATEST

Dr. Sigmund Freud, the most prominent figure in modern psycho-analysis, is the world's newest movie director. He is planning a psycho-analytical film for a German motion picture concern that willexpress his teachings in popular form. This picture is expected to make a stir, for Dr. Freud is to have an entirely free hand from a scientific point of view in the shaping of the film. Psychologists in America have expressed their interest and will undoubtedly ask that the film be shown here.

AIR MOISTURE RULES FOREST FIRES

Humidity, rather than temperature, is the atmospheric condition which regulates the spread of fire in the bush and in theforest. This is the conclusion arrived at by the forest service of the Ontario government, which is taking extra precautions against possible fire in the forest and game reserve about Lake Temagami.

Stress is now being laid on the humidity record as a result of the observation that the majority of disastrous fires in the bush are spread through the carpet of debris on the forest floor. This collection of rubbish, composed of dried pine cones, dead needles, withered fronds of brokenn and fallen trunks, is highly inflammable whenever the moisture content of the surrounding air is much below the saturation point. On the other hand, when the atmosphere is laden with water vapor, there is little danger of the rapid spread of fire.

Few serious fires have been known to spread through the tree tops, and this seldom occurs excepting in a gale. When the humidity is down to 30, which means that the air contains 30 per cent. of the vapor it will hold at the temperature and barometer pressure prevailing, a ground fire, if started, is sure to spread; but when the humidity registers 50 to 60, or half way to the saturation point, there is practically no danger of rapid spread of fire.

The fire-rangers are being equipped with hygrometers, which compare quickly the capacity of the air with the amount of water it is holding at the time. Then when the reading drops below 50, the observers in the airplanes are required to be specially watchful, as a blaze must be checked at once under these circumstances.

In Druid Hill Park, Baltimore, Maryland, there is a unique sun dial which shows the time in all the principal cities of the world.

HEAVIEST LITTLE STAR UPHOLDS EINSTEIN IDEA

In spite of all attacks, the theory of relativity is still on a firm foundatic according to Dr. Charles E. St. John of the Mt. Wilson Observatory. All the tests of the theory suggested by Einstein, and several he did not think of, have supporte the theory when put to trial, the California astronomer asserted.

One of the crucial tests of relativity consists in measuring the spectrum shif If light has mass, as the Einstein theory postulated, it is subject to gravitational attraction. Therefore the sun would tend, at least slightly, to pull back its light even at the moment it sends it out. This would lead to the displacement of the color lines in the sun's spectrum as compared with the spectrum of a source of light having little gravitational attraction, like an arc light here on earth. Dr. St. John made this test with delicate instruments, and found the predicted shift.

Since then, other astronomers have looked for this effect, and they say there is such a shift, but that it varies with the lines, the stronger ones showing more shift than the fainter, which is not in accord with the relativity theory. However Dr. St. John, working with the world's most powerful spectroscope on the 150 foot tower telescope at Mt. Wilson, has not found this variation.

Finally, the work of his colleague, Dr. Walter S. Adams, director of the Mt. Wilson Observatory, has shown the Einstein shift elsewhere in the heavens. The dog-star, Sirius, which is a conspicuous object in the late summer sky, has a small companion star, not visible to the naked eye. Though small, it is enormously heavy, denser by far than anything known on the earth; it has been calculated that a pint of its substance would weigh twenty-five tons. Such density gives it an enormous gravitational pull, which makes it an especially advantageous sun for the testing of the Einstein shift. With the aid of the great Mt. Wilson telescope Dr. Adams has made photographs which show the displacement of the lines corresponding to this great density, according to Einstein's predictions.

RUSSIANS EXPLORE FOR ANTIQUITIES AND WEALTH

Scientific expeditions to the four corners of Russia will search for knowledge of prehistoric culture and customs as well as for natural resources that can be developed for present use, according to the New York Bureau of the Russian Telegraph Agency. While one party goes to the Volga provinces to study prehistoric culture there, another is going into Finnish territory to study the local languages, races and customs.

Asiatic expeditions are being organized to uncover antiquities in Daghestan and to study the economic possibilities of establishing fisheries in the lake of Issik-Kul in Turkestan and of developing the rich resources of Ferghana near Samarkand, and land of Tamerlane.

The land and property invested in almshouses in the United States was valued at about $150,000,000 at the end of 1924.

INSULIN MAY HELP GLAND REGENERATION

That the continued use of insulin may really cure and not just allay diabetes by giving the overstrained glands a long rest, is the opinion of Dr. F.G. Banting, who first extracted insulin from the pancreatic glands of animals and made it available for use by diabetic patients.

"Regardless of the severity of the disease," said Dr. Banting, "all patients may now be maintained sugar free. Since this is possible it is to be strongly advocated for we have abundant evidence that there is a regeneration of the islet cells of the pancreatic glands when the strain thrown upon them by high blood sugar is relieved. In some moderately severe cases the carbohydrate tolerance has increased sufficiently so that insulin is no longer necessary.

SOY BEAN RECOMMENDED FOR USE IN ENAMELS

Soy bean oil is not merely a partial substitute for linseed oil, but actually its superior in certain uses, notably in the manufacture of white enamel, according to I.C. Bradley of Bloomington, Illinois, who addressed the sixth annual field meeting of the National Soy Bean Growers' Assocation at Washington. Though rated only as a semi-drying oil in its natural condition, Mr. Bradley stated that by heat treatment and the addition of driers it can be made to do much of the work of linseed oil.

Not only are soy beans becoming more valuable as a source of vegetable oil, because of their high oil content, but the oil cake is so rich in protein as to make it even more valuable than the oil itself. Mr. Bradley stated that the money value of this by-product of oil extraction was one-third greater than the value of the main product, a reversal of the usual order of things.

The soy bean is remarkable among the bean tribe in that it contains oil instead of starch. Its oil content averages about 20 per cent., of which about two-thirds can be extracted by commercial methods. The protein content is remarkably high, averaging around 40 per cent.

A wave of enthusiasm for tobacco cultivation passed over the Holy Land last year and as a result thousands of acres were devoted to it in Arab and Jewish villages, yielding a crop which indicated that it may become one of the chief sources of agricultural wealth in the future.

The legendary lotus, the fruit of which made Ulysses's sailors forget their homes, is supposed to have been the same plant now used by natives of northern Africa to make sun-dried cakes which taste like gingerbread.

Within the past five years, foreign missionaries have aided agricultural science in this country by sending nearly 500 shipments of seed and other plant material to the U.S. Department of Agriculture.

The distance around a cylinder increases six and one quarter inches for every inch of thickness of a layer of material placed on it, regardless of the original diameter.